

Event Horizon

May 2003

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II Hz 4 - An Odyssey

by Tom Steckner

It all started simply enough with an e-mail from Anthony Tekatch:

Hello Experts,

Would one of you like to tackle this question for the newsletter?

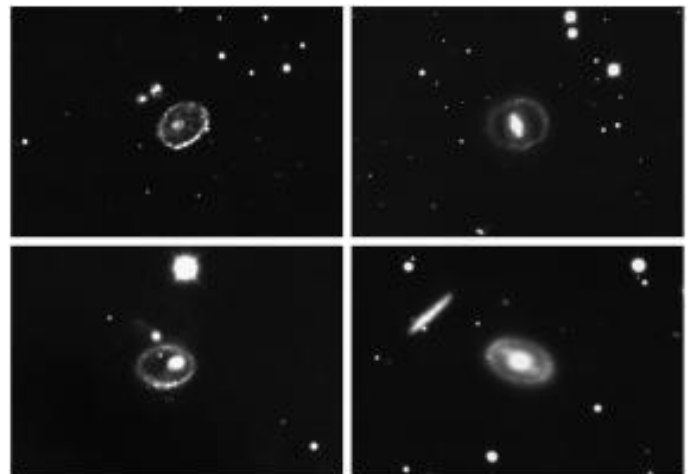
Would you please send me information on Herzog 2 the galaxy. I know it looks like this (0 0) and that it's a gamma ray source for the colliding galaxy effect. Yet I don't have the facts how; 1) far away it is and 2) where it is of what constellation? Who may I ask for a telescopic 35mm photo of the Herzog 2 to buy for under \$20.

Question by Scott Florance, Seattle WA

On the surface at least the request for information about "Herzog 2" seemed like it should be simple enough to satisfy. First of all, I had often enough seen the name Herzog in connection with studies of peculiar galaxies. Second, just about every catalogue ever created in astronomy is available somewhere on the Web. So it was going to be "just" a matter of finding some time to do the research. (Not a problem if you ignore the 8 (ha!) hour per day job + 2 hour per day commute, kids, wife, household duties, etc., etc.) Not.

My first attempts to find some information was with simple searches using the Google and AltaVista search engines. I got tons of hits on the name Herzog, but (if confined to subjects astronomical...) most referred to papers written by this astronomer or to papers which referenced his work. So I then tried the Vizier search engine, which is a specialised search engine for locating only astronomical objects. Still no luck. Now this was starting to get a bit weird. So I went back to Google and AltaVista and started reading through all the astronomy-related hits I got and came across

one reference that seemed to be useful and authoritative: http://www.noao.edu/image_gallery/html/im0117.html (I'll refer to this as "URL 1"). However, the only Herzog designated object they showed was something called II Hz 4 ("Hz" = "Herzog"). This implied that there were at least two Herzog catalogues (i.e., inferred from the "II") and that "Hz" was the standard abbreviation for objects in this catalogue. So, back to Google, AltaVista, and Vizier. Nothing. So I went back to URL 1 to study it some more and noticed an e-mail address at the bottom of it. What the heck, I thought, and sent off a note - let's see if we can get the NOAO to answer me. :-)



*Four ring galaxies from URL1
C.R.Lynd, KPNO 4-m/NOAO/AURA/NSF*

This is how I got to know Dr. Nigel Sharp, a man with a wry sense of humour, a willingness to talk to a non-professional, who seemed to know lots of people in the astronomical community, and was more than willing to help me chase this elusive "Herzog 2" that Scott referred to.

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Chair's Report

Finally - decent weather! We've even had our first successful observing night! Thanks to our Observing Director, Stewart Attlesey, for making the arrangements and, of course, bringing along his wonderful "0.5 metre" telescope.

Our speaker this month seems wildly appropriate - Mark Robinson speaking about "Stormchasing". Since we have also had our first decent storms of the season, we are all jazzed to hear about journeying into the cores of the wild ones. Like they say, if you can't beat 'em, join 'em.

Now that lectures are finished, I have actually taken the opportunity to get out observing some nights recently. I was so impressed by Bob Botts's webcam images that I went right out after the last HAA meeting and got myself a Philips ToUcam Pro! Bob has kindly allowed me to use his 12-inch Meade LX200 to image Jupiter and the Moon. It is really astounding what these cameras can do. At video rate, with just their own lens, they can detect 1st magnitude stars like Castor and Pollux. Along with the free

software utilities K3CCDTools and Registax, you can get some truly astounding images working to your telescope's diffraction limit. Just 30 years ago, even the largest telescopes in the world couldn't acquire images of the planets and the Moon which are as clear as the ones coming off of Bob's scope. If you haven't seen his animation of a Jovian shadow transit, check it out on the HAA webpage!

Speaking of webpages, I would like to thank Rick MacDougall once again for his generous donation of hosting the HAA website, www.amateurastronomy.org!

Also, Anthony Tekatch has continued to do an excellent job of maintaining it - in all the spare time he has left over from editing Event Horizon ... Gigathanks for that, too.

Finally, I hope that you will join us for the HAA Star Party weekend at Silent Lake Provincial Park for Fri, May 30 and Sat, May 31! Beautiful dark skies and fun people. What more could you want?

Doug Welch

Doug Welch is the current chair of the HAA and also a founding member. You can find out more about Doug at: http://www.physics.mcmaster.ca/people/faculty/Welch_DL_h.html



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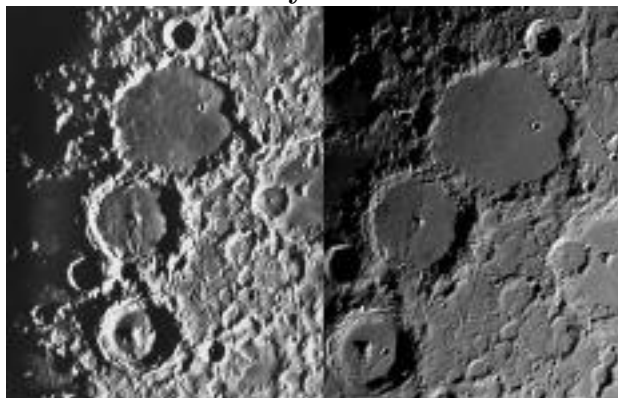
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Photo by Doug Welch



Your photo could be here, send it to editor@amateurastronomy.org

See these photos and more in colour on our web site amateurastronomy.org.

... cont'd from page 1.

His first of many responses to me started like this: "Ah, the dear old Herzog "catalog" - no, not everything in the world is online, and this is decidedly not, I fear. You might actually have to resort to a real library, but you'd need an astronomically specialised sort of library and not even many of those would know. It's one of those old-fashioned things that used to happen (and is starting to happen again in particle physics), where lists were circulated without ever really being published." I could see this was going to be fun.

Really. As we continued to correspond, memories started to flood back. You see, back when I was in high school I started to get serious about astronomy. Around the time I was in Grade 10 I was introduced to an IBM 036 keypunch machine. Remember those cards you used to fill ("bubble") in using a pencil, or those cards you'd get in the mail from, say, the gas company with a few little holes punch in them? (However, only in recent times did I find out that those little bits of paper that were punched out were called "chads.") Well, I thought that those cards would make beautiful index cards for sorting and coallating all those astrophotos I planned on taking with the telescope I was going to buy one day. I had no idea where the money for that was going to come from, but that was just a "minor" detail; eventually I even tried to grind my own mirror to get around that problem.

Anyway, also at this time I found a book in the local library (in London, Ont.) by Hans Vehrenberg called "An Astronomical Atlas", or something like that. What fascinated me about it was the matched pairs of pages - typically one pair per constellation - with the constellation charted on the right side and mini-catalogues for objects shown on the left side. Thus, there was such data as right ascension, declination, magnitude, spectral, dimension, etc. for the brightest stars, clusters, galaxies, etc. What really had me wondering, though, was those numbers in the first column beside the non-stellar objects. NGC-something-or-other. At around this point I made a fateful decision: I bought a spiral ring notebook with about 250 pages in it and about (I don't recall exactly any more) 30 or 35 lines per page with the idea that I could write out one line per object from this book and others, and eventually build up a complete copy of the NGC (New General Catalogue of Non-Stellar Objects) catalogue. How many entries were there? I didn't exactly know, but in Vehrenberg's book the numbers went up into the seven thousands. After

writing out all the entries in Vehrenberg's book, I realised that I had very little in my book - maybe 300 to 400 entries. So I started to look around for more.

Well eventually these two thoughts came together: put the entries in my spiral ring notebook onto computer cards. You see, the 036 not only punched little holes in the cards (which at first I wasn't interested in), but also typed across the top of the card (up to 80 characters), and they happened to be a nice size for sorting things like astrophotos. So I worked out a basic format: 4 characters for the NGC number, 6 characters for R.A., 5 characters for declination, 2 characters for object type, 10 for object size, 4 for visual magnitude, 4 for photographic magnitude, a few more for object classification or spectral type, several more for miscellaneous other info (e.g., for open clusters, how many stars were in it; for planetary nebulae, the magnitude of the central star; cross references into other catalogues such as Messier's; etc.) and a space here and there to make it look orderly and line things up properly.

Well I soon got serious about trying to figure out how to complete my copy of the catalogue and started burrowing deeper and deeper into various libraries. Eventually I wound up at the Natural Sciences (NatSci) library at the University of Western Ontario (UWO) in London, Ontario. Then it happened. I ran across a copy of the "Revised" NGC (RNGC), containing all 7840 catalogue entries. Actually, it was more than that because some entries were multiple; e.g., NGC 1316 in Fornax is actually four entries in the catalogue: 1316, 1316A, 1316B, and 1316C. Well, without quite realizing the magnitude (no pun intended) of the decision, I bought my own copy of the book (a significant expense for someone whose only income was from a paper route shared with a brother) and I proceeded to key up all the catalogue entries. I'll spare you the details of how this was done and where I got the time from, but suffice it to say it took months. And months. As the cards started to pile up I would occasionally send batches of them along with the computer science teacher, to have them printed off when he went to deliver the punched cards from his students assignments to another school which actually had the computer we used (a Honeywell with 16kB of RAM). (Yup, we got to try to run our programs all of once a day.) I would then disappear into the stacks at the NatSci library, trying to find out more about the objects I was keying in. I started to learn all about the Astrophysical Journal, Astronomical Journal, Astronomy and Astrophysics journal, the de Vaucouleurs galaxy catalogues, the Arp galaxy catalogue, the UGC

galaxy catalogues, the Zwicky et al galaxy catalogues, open star cluster catalogues, planetary nebulae catalogues, and the list goes on and on. Then I started compiling a cross-reference catalogue (e.g., NGC 383 = UGC 689, 3C31, 4C+32.05, PKS0104+032, and Arp 331; the 3C, 4C, and PKS numbers coming from catalogues of radio sources), a bibliography, legends to explain all the entries (e.g., I = a very concentrated globular cluster, II through XI being less and less so, and XII being very poorly concentrated). In the end I accumulated approximately 10,000 computer cards! That meant there were five boxes of them, as each held only 2,000 of them. By this point I was in grade 12 and was fortunate enough, via an outreach program at UWO to the London high schools, to get an account on one of the computer systems (a DECsystem-10) in the same building as the NatSci library - how convenient. I had to rely on my parents to transport me back and forth to the computing centre since only two boxes, which weighed a ton, would fit in my large school backpack. It was actually a good thing I had access to this resource. First, my high school teacher didn't want to run off printouts any more (10,000 cards took too long) and I had to write a program to preprocess the positions of the objects in the RNGC from 1975.0 (a non-standard epoch!) to the newly official 2000.0 standard.

Well before I got sophisticated enough to use the UWO computers to store and manipulate the data, disaster struck. One year the London Centre of the RASC played host to the annual RASC General Assembly (GA) and I decided to enter my NGC catalogue into the GA competition. And I wanted my catalogue to look as nice as possible. A friend of mine, who had access to a nice printer at his high school, offered to print the catalogue off. Well, we had all sorts of trouble that day with the computer and didn't get a complete printout (on the old fan-fold paper) until late in the evening. By the time he dropped me off at home, it was quite late and my parents had already gone to bed. So I decided to leave the cards in the trunk of his car and retrieve them in a day or two. Well, the dampness of that time of year got to the cards and warped them by the thousands... To recover the data I went back to UWO to use a special keypunch machine which could duplicate computer cards. I had to carefully hand feed each warped card and duplicate it. Sometimes I even had to cut away parts of the original card with a pair of scissors so it wouldn't jam the machine. (Of course the cut away part of the card was interpreted by the duplicator in the same way as actual holes in the card.

So I sometimes could only duplicate part of a card and then had to re-key the rest.) Needless to say, I had just discovered the value of backing up your data. I soon after obtained a magtape (yup, one of those big reels of magnetic tape you see in the old scifi movies) from my high school teacher, read all the cards into the DECsystem-10, and backed the data up onto tape.

Work on the catalogue pretty much came to an end by second year university. I often made extensive further enhancements to it while on my work-terms at the University of Waterloo (UW). (Because of my work on the DECsystem-10 at UWO, I got a job with Digital Equipment in Toronto. There I pretty much had the run of a small DECSYSTEM-20, which was compatible with the "10s". My boss there had installed the 10 at UWO himself! Back then you remembered every one of these large computers you installed because each was such a significant event.) I almost even got it published, until the publisher got "sidetracked" publishing the Webb Society handbooks instead; thereafter they lost interest when found out that Sky Publishing was coming out with their NGC 2000. Just as well - I later discovered an error in the precession program I had written and some of the positions were wrong. Also, as I researched the catalogue more and more, I began to understand (without actually knowing the term) what a "systematic error" is. I started running into more and more problems getting the data from the various catalogues to mesh. The worst was the apparent sizes of galaxies. For example, the sizes in the de Vaucouleurs galaxy catalogues often were significantly bigger than size from other sources. At the time I just didn't understand the differences in the methodologies used to make these measurements.

Anyway, back to II Hz 4. One of the other memories Nigel Sharp tripped off happened when he wrote: "I confess the only member of the Herzog lists I know is II Hz 4, ... Herzog was Zwicky's principal collaborator on the Zwicky catalog of galaxies (6 volumes)." Well the Zwicky catalogues had been one of my sources for my NGC catalogue! And then came this after I discovered there was an "HZ" catalogue of stars too: "The standard stars are from a list of faint blue stars compiled by Humason and Zwicky (HZ, sigh)... Back to galaxies. Chip Arp says he never really had any lists from Herzog, just scraps of paper from time to time, and he didn't keep them." Halton ("Chip") Arp! Another source for my NGC! I had used for my catalogue a book called "The Redshift Controversy." It recorded a debate between Halton Arp and John Bahcall, about whether

the redshift in the spectrum of some galaxies was due to non-cosmological effects. In other words, some redshifts maybe arose for reasons other than just the effects of the expansion of the universe. For example, some seemingly gravitationally bound clusters of galaxies would have a member with an anomalously high redshift (e.g., one of the galaxies in Stephan's Quintet). I found the debate fascinating. Equally fascinating were the papers in the appendices of the book which each debater was allowed to bring forward as evidence to support their argument. Many papers contained data for lots of NGC objects: classifications, redshifts, etc. I used these to fill in some of the blanks in my spiral ring notebook. Arp was a hero of mine, not because he was right (though I hoped he was) or wrong, but because he was as we say now "thinking outside of the box." Thinking about, and looking at a problem in an unconventional way and challenging others to explain what he saw even though it didn't fit nicely into the accepted understanding of cosmology. And here he was, 25 years after I read the book, indirectly helping me figure out what a "Herzog 2" is.

So, what did we conclude in the end? "Herzog 2" is in fact probably "II Hz", "II Hz 4" in particular. More info about this object seems to be almost impossible to find beyond the picture at "URL 1" listed at the beginning of this story. The only other reference I could find to it was on the NED system: http://nedwww.ipac.caltech.edu/cgi-bin/nph-objsearch?objname=II+Hz+4&extend=yes&out_csys=Equatorial&out_equinox=B1950.0&obj_sort=RA+or+Longitude&zv=z&zv_breaker=10000.0 ("URL 2"). As for buying a photo of it, I wasn't able to find anything like that; the image at "URL 1" is too small to make an effective photo from it. Maybe one day the Hubble will image it with the ACS camera and then you would be able to get the photo you'd like.

Well, that's the end of my story and my answer to Scott. I'm sorry you didn't get what you asked for - but hopefully you enjoyed the story. I certainly learned lots on this little caper, many great memories were recalled, and one of those stories even had a chapter added to it. So, Scott, I thank you for asking the question!

by Tom Steckner

Upcoming Events

Item Future Observing dates

Dates May 23,24,30,31, June 27,28

Date Friday, May 9th, 2003 (Tonight)

Speaker Mark Robinson

Topic "Stormchasers: The Real Story"

Location Hamilton Spectator Building

More Info <http://209.151.141.15/purchaseii/>

Date Saturday May 31 and Sunday June1, 2003

Event HAA Star Party

Location Silent Lake Campground

More Info Article in this newsletter

Date Saturday, June 7th, 2003

Topic 2003 Binbrook Day

Location Binbrook Conservation Area

Admission The day-use admission fee will be waived for the day

Details Several outdoor recreational activities will be promoted

Date Friday, June 13th, 2003

Speaker Dr. Peter Brown of UWO

Topic Meteors: Infrasound and Satellite Data

Location Hamilton Steam Museum

More Info <http://www.astro.uwo.ca/pbrown/>

Date November 8th, 2003

Event HAA Anniversary Party

Location Royal Botanical Gardens

Newsflash

We have access to the washrooms at the observing site in Binbrook!



Abbe Chappe d'Auteroche's life was brief but spectacular. Born into a noble and wealthy family in Mauriac in the Auvergne where he studied with the Jesuits, later at the College Louis-le-Grand in Paris. His proficiency in mathematics and astronomy were recognized by his teacher who sent him to Cesar-Francois Cassini de Thury, a.k.a. Cassini iii (1714-1784), at Paris's Observatory. Cassini, gave him Halley's tables to augment which began to be published in the mid 1750's, thus putting him in the middle of astronomy's most urgent problem, the transits of Venus and their potential for establishing solar parallax. Chappe's "star glows briefly", as Harry Woolf writes, on the 18th c. astronomical horizon, "more for the zeal and activity which it represents in the life of science than for the little light it sheds upon problems of astronomy".

Chappe was admitted to France's Royal Academy in 1759 joining a brilliant group of men all working on the 1761 transit project, le Gentil (1725-1792), Alexandre-Gui Pingre (1711-1796), and his mentor, Cassini iii.

Keeping in mind that the 1761 transit took place during the Seven Years' War, when France and Britain were battling to keep or to win and expand their colonial territories. Astronomers took great risks to reach far-flung observation stations. While both combatants had agreed to a *laissez-passer*, it unfortunately was not always observed. The British team of Mason and Dixon, e.g., barely out of port on their way to Bencoolen, Sumatra, were attacked by an overzealous French warship. The ship was forced to return to Portsmouth with 11 dead and three dozen wounded. Mason and Dixon

were not anxious to go out again but the Royal Society was adamant that they must!

Abbe Chappe was to be sent, at the invitation of the Russian Imperial Academy of Science, to Tobolsk, some 5000 kms from Paris where the transit would be visible in its entirety.

In order to get there in time, Chappe set out five months earlier accompanied by a "colonel in the service of the King of Poland". Hoping to avoid the war, he planned to take a Dutch ship sailing east along the North coasts of Europe, but he was too late to catch the last ship of the season. Just as well, for the ship ran aground off the coast of Sweden, but he would not escape other tragedies. This meant a long and rough overland trip via Strasbourg, Vienna, Warsaw, St. Petersburg, Moscow, then across the Siberian plains over the Urals to Tobolsk.

The first leg of his trip to Strasbourg was over roads so bad that his carriage and some of his instruments were damaged. While he waited for a new carriage he repaired his instruments before going on to Ulm where he took a boat down the Danube to Vienna despite warnings that river fogs could delay him further. During the trip he mapped its every turn, "knowing we had no particular map of the Danube in this part of its course". The boat travelled only during the day, and when the fog kept it on shore he climbed nearby mountains measuring and recording.

He was welcomed in Vienna with a grand reception on New Year's eve, 1760, by Maria Theresa, her husband, Francis I, the Holy Roman Emperor, and his son who would replace him in 1765 as Joseph II. (1) In Vienna he met local astronomers, including the Jesuits, Father Hell and Father Liesganig. They compared instruments, exchanging information about the upcoming transits, working together they determined the magnetic variation in Hell's observatory.

It was very cold too, on January 8th 1761. The temperature was minus 23 Celsius as Chappe accompanied by M. Favier the new Secretary of the French Embassy at St. Petersburg and their team made their way to Warsaw arriving January 22nd. Five days later they crossed a frozen Vistula, arriving in Riga February 7th. There they transferred to sleds that carried them on "with the greatest velocity", arriving in St. Petersburg a week later.

Courtesy demanded that he pay his respects to

France's resident minister, Baron de Breteuil and to the Imperial Academy of Sciences. With Breteuil's help and that of Count Woronzof, Russia's High Chancellor, transportation arrangements were made for the journey to Moscow. Empress Elizabeth Petrovna (2) made sure his team had all it needed "from bread to interpreters".

They left March 10th in four enclosed sleds, each drawn by five horses running abreast. Chappe with his provisions were in one sled, the watchmaker and Chappe's servant in another, a Russian sergeant representing the government as a guide in the third and all the instruments in the fourth. Four days later they were in Moscow, the sleds damaged and beyond repair. On March 17th they set off again to cover 3800 kms in bitterly cold weather which they hoped would last knowing that an early thaw meant delay.

All the while Abbe Chappe was writing, writing, writing about everything he saw while the sleighs "went on with inconceivable swiftness", racing to reach Tobolsk before spring thaw which they did six days before the ice broke up on the last river they crossed, arriving mid April. Chappe left descriptions of terrain, weather, people, disease, sweat-baths, and some excoriating comments about Russia's backwardness that didn't please young Catherine, the Empress in waiting!

Chappe was well served at Tobolsk, the governor assigned four military men to guard him and his work. He lost no time building his observatory; it was ready by May 11th. He then began his daily observations and on May 18th he observed a lunar eclipse. On June 3rd he observed a solar eclipse. Both events were significantly important for him to determine longitude and latitude of his observatory. "I could not expect to find from observing the eclipses of Jupiter's Satellites, because this hemisphere, in the summer time, is almost constantly lighted by the sun: and besides, this eclipse being visible also at Sweden, Denmark, and St. Petersburg, I was sure of meeting observations to answer mine". Delisle sent him the Swedish calculations enabling him to calculate the longitude of Tobolsk as 4 hours, 23" 34' east of the Paris meridian.

Chappe worked day and night. Some locals blamed him and his observations on the flooding of the city's river, the Irtysh, that caused heavy damage. His guards had to be increased to protect him from a mob. To satisfy their curiosity and that of the governor, the archbishop, and local nobility and to acknowledge their cooperation he set up a tent outside the observatory with a telescope in it for their use. This public relations strategy left him to work undisturbed.

Transit day arrived, a perfect day, so perfect that Chappe set up his telescope in the open air. He assigned the recording and watching of the clock to the watchmaker and the interpreter to count the time. As he waited for Venus to begin her journey across the sun, he writes "I was seized with an universal shivering, and was obliged to collect my thoughts in order not to miss it....Pleasures of the like nature may sometimes be experienced; but at this instant, I truly enjoyed the pleasure of my observation, and was delighted with the hopes of its being still useful to posterity, when I had quitted this life". He did well, for his observation records were still considered useful in calculating the scale of the solar system more than a hundred years later.

Mounted couriers were sent off to St. Petersburg and Paris within a few days carrying the results and calculations. He remained in Tobolsk three more months during which he established Tobolsk's precise longitude and latitude, the parallelism of the fixed telescope on his quadrant and the exact value of each turn of his micrometer screw. He conducted experiments in electricity and magnetic variations as well as the length of the seconds pendulum, besides taking trips around the area to record its geology, meteorology, natural history and social customs.

He spent some time in St. Petersburg, writing, an eye witness, during a turbulent period in Russian history. Russia had three monarchs within less than a year in 1762. The old Czarina, Elizabeth, died Christmas day, 1761 (old style), succeeded by her unfortunate nephew, Peter III. Six months later Peter was overthrown in a coup, his wife acclaimed as Catherine II.

Chappe took a different route back to Paris, traveling south through the Ural Mountains iron district, via the mining town of Ekaterinburg (Sverdlovsk where the Romanov family was murdered) where he examined the mines describing their variety and quality.

Eighteen months later he was back in Paris preparing to read an account of his trip to the Academy in November 1762.

At the end of 1767, the Academy was considering Chappe's proposal to go to the South Seas, however, Spanish permission was not obtained, instead, France asked about Mexico/California. The English had been refused permission for California and the King of Spain had decided to send his own astronomers which led to an invitation to France to send its astronomers with his.

Chappe was on his way to Cadiz September 18th, 1768, accompanied by his servant, and three people assigned to assist him: Pauly, an engineer and geographer,

the artist, Noel, and Dubois, a clock and instrument specialist. A Spanish fleet was forming to sail for Vera Cruz in mid October, but Chappe wanted to be on his way immediately, and arranged to have a small ship outfitted for his use. With his team and the two Spanish naval astronomers, Vincente de Doz and Salvador de Medina, Chappe sailed across the Atlantic, arriving in Vera Cruz March 8, 1769, a crossing that took 77 days!

While at sea Chappe conducted various experiments including measuring magnetic variation, but gave up in disgust with Abbe Rochon's "new telescope", whose field was adequate to see Jupiter but too small to view its satellites. He complains about doing "tedious calculations" required to determine longitude using the lunar method and writes that "it is doubtful...whether it will ever be fit for the use of trading vessels". He continues, "This convinces me that the use of time-keepers, from its extreme ease, will be found to be of more general service in the navy; it requires no instruments but what seamen are accustomed to...lastly, the calculation is short and easy".

Chappe organized a "Indian-led safari" of mules that set out to cross over 1000 kms of Mexico's wild terrain, a two months' trip over "the worst roads imaginable...high mountains...dry deserts". His assistant, M. Pauly wrote that "we came near to dying a thousand times". The heat was "excessive", it ruined their food, leaving them with little strength "to drag ourselves around". They arrived on the west coast at San Blas, about 200 kms south of Mazatlan. From there they took ship for a further six weeks' sail, arriving May 16th at the Mission of San Jose del Cabo, located at the tip of Baja, near Cape Lucas in the middle of a raging epidemic.

They were advised to move north, but they were exhausted and June 3rd was fast approaching. Whatever was going around, they all caught it, likely malaria from the vague description of symptoms. Chappe set up his observatory, a well equipped one: two achromatic Dolland telescopes, two quadrants of 3' and 1 1/2' and a "fine pendulum clock" by the transplanted Swiss horologist, Ferdinand Berthoud (1727-1807).

Chappe, by now an experienced astronomer, not to mention well travelled, began his observations. After the transit which went well, and considered the most complete made for 1769, he established the mission's longitude position by the June 18th lunar eclipse as well as by observing the "immersions of the first and second satellites of Jupiter".

He had intended to stay in Mexico for further experiments but by mid June he was very ill and died August 1st, age 41. More than three-quarters of the lo-

cal population including the mission priest, died. Only Pauly of his personal staff survived though ill himself. He managed to pack all their belongings and sent them to Mexico's Viceroy, asking that they be sent to the Academy. He wasn't sure he was going to make it back himself. On the long journey home, he sometimes had to rest weeks or months to regain his strength, arriving in Paris one year later in 1770! The King gave him a pension. He never worked again.

Reference Notes:

1. Francis I and his sons were to be the last of the Holy Roman Emperors. Francis II conceded defeat to Napoleon after the battle of Austerlitz in 1805, renouncing the title of Holy Roman Emperor. Voltaire commented in 1756 that the "agglomeration...which still calls itself the Holy Roman Empire was neither holy, nor Roman, nor an empire".

2. Elizabeth Petrovna was the unmarried daughter of Peter the Great, she died Christmas day, 1761 (old style). She was interested in science as well as the arts, supporting astronomy and specific individuals, e.g. Mikhail Lomonosov. Lomonosov also observed the transit from his home in St. Petersburg, noting that Venus had an atmosphere. He died in 1765. Under her regime she continued to invite scientists from France sought to teach at the Imperial Academy of Science at St. Petersburg including the astronomers and mathematicians Bernoulli, Delisle and Euler and Chappe.

Further Reading:

Chapman, Alan. "The transits of Venus", *Endeavour*. Vol. 22 (4) 1998 148-151. He references and quotes from both Chappe's and Pauly's memoirs. Chappe's has been translated into English, see Nunis below)

Holmes, Kenneth L. Translator with new Introduction of the published journal, *A Voyage to California by Jean Chappe d'Auteroche*. Richmond Pub. 1973.

Nunis, Doyce Blackman. *The 1769 Transit of Venus, The Baja California Observations of Jean-Baptiste Chappe d'Auteroche, Vincente de Doz, and Joaquin Velazque Cardenas de Leon*. Natural History Museum of Los Angeles County:1982.

Van Helden, Albert. "Measuring solar parallax: the Venus transits of 1761 and 1769 and their nineteenth-century sequels", 153-168. *The General History of Astronomy. Volume 2 Edited: Rene Taton and Curtis Wilson*. Cambridge:1984. ———— *Measuring the Universe: Cosmic Dimensions from Aristarchus to Halley*. U Chicago:1985.

Wolf, Harry. *The Transits of Venus*. Princeton:1959.



In Search of Alien Oceans by Patrick L. Barry
and Dr. Tony Phillips

A robotic submarine plunges into the dark ocean of a distant world, beaming back humanity's first views from an alien ocean. The craft's floodlights pierce the silty water, searching for the first, historic sign of extraterrestrial life.

Such a scenario may not be as fantastic as it sounds. Many scientists believe that Jupiter's moon Europa conceals a vast ocean under its icy crust. If so, heat from the moon's interior—which would keep the ocean from freezing solid—may also drive subaquatic volcanoes and hydrothermal vents. On Earth, such deep-sea vents provide chemical energy for ecosystems that thrive without sunlight, and some scientists even suggest that Earthly life first got started around these vents.

So a warm European ocean spotted with thermal vents could be a natural incubator for life. That's why some scientists hope that someday we will send a probe to Europa that could bore through the ice and explore the ocean below like a submarine.

To plan for such a mission, scientists would first need to put a camera in orbit around Europa. By looking for places where water has welled up to fill the spindly cracks that riddle Europa's surface, scientists can estimate where the ice is thinnest—and thus easiest to bore through.

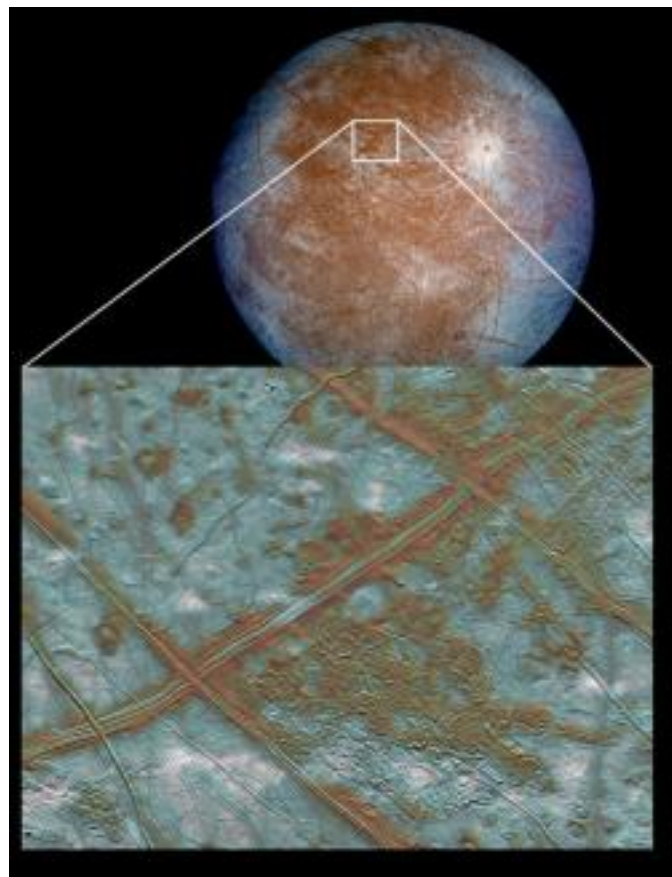
That mission scenario presents a problem, though. Europa orbits Jupiter inside the giant planet's punishing radiation belts. Continuous exposure to such high radiation would damage today's scientific cameras, making the information they gather less reliable and perhaps ruining them completely.

That's why NASA is designing a more radiation-tolerant CCD that could be used on a mapping mission to Europa. A CCD (short for "charge-coupled device") is a digital camera's chip-like core, which converts light into electric signals.

"We've seen the effects of this radiation during the Galileo mission to Jupiter," says JPL's Andy Collins, principal investigator for the Planetary Imager Project. "Galileo has orbited Jupiter for many years, dipping inside the radiation belts only for brief intervals. Even

so," he says, "we've seen clear signs of damage to its instruments."

By using the hardier CCD's developed by the Planetary Imager Project, a future probe could remain in Jupiter's radiation belts for many months, gathering the maps scientists will need to finally get a peek behind Europa's icy veil. And who knows, maybe there will be something peeking back!



Cracks on the icy surface of Jupiter's moon Europa give evidence of a liquid ocean below.

To learn more about the Galileo mission to the Jupiter system, visit <http://www.jpl.nasa.gov/galileo/>. For children, a fun, interactive "Pixel This!" game at http://spaceplace.nasa.gov/p_imager/pixel_this.htm introduces CCDs and how a really tough one will be needed for a future mission to Europa.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration. <http://spaceplace.nasa.gov>

June 2003

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
1	2	3	4	5	6	7 Binbrook Day	
8	9	10	11	12	13 HAA General Meeting Steam Museum	14	
15	16	17	18	19	20	21	
22	23	24	25	26	27 Observing Night	28 Observing Night	
29	30						
			For observing info, call Stewart Attlesey 827-9105, Rob Roy 692-3245, Glenn and Gail Muller 945-5050, http://amateurastronomy.org/events.php		May 2003 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31		July 2003 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31



The Hamilton Amateur Astronomers
proudly announce:

THE HAA 10TH YEAR ANNIVERSARY BANQUET

When: Saturday, November 8th, 2003

Where: The Royal Botanical Gardens

Why: To celebrate 10 years of success (since inception)

What: Cocktails, dinner, guest speaker and door prizes

Who: Bob McDonald, Quirks and Quarks (CBC)

Bonus Event: Full lunar eclipse that night!



MARK YOUR CALENDARS ! (DETAILS TO FOLLOW)

